INSYS
MICROELECTRONICS

Manual

INSYS GSM 4.2
INSYS GSM 4.2 compact

Sep-06

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1   Introduction

Validity range of the manual

This user manual applies to the devices INSYS GSM 4.2 and INSYS GSM 4.2 compact.

Purpose

This manual is directed primarily at technical staff, in particular:

> ➢ Programmers

> ➢ Implementers

Required basics

General knowledge regarding communication technologies is required.

Safety Instructions

This manual includes notes which must be observed in order to avoid material damage. The warnings and cautions are described as follows:

Caution - Damage of components!
Not observing this note may result in destruction of the device.

Warning!
Not observing this warning may result in malfunction.

Note
Notes contain important information which you should observe in particular.

Warning!
The device may only be used for the cases of application provided in the manual.

Online availability

The manuals are available in German and English at http://www.insys-tec.de.

Conventions

In the manual, the devices INSYS GSM 4.2 and INSYS GSM 4.2 compact are both called INSYS GSM. Only if there are differences between the devices, the complete device name will be used.

Emphasis

Representation	Meaning
"Basic settings"	Software HSComm GUI texts, e.g. button, entry field, tab description
AT	**AT** command
<expression>	Entering of the parameter for an **AT** command
[expression]	Entering of the optional parameter for an **AT** command
OK	Response of an **AT** command

Notes for entering AT **commands**

AT command descriptions are displayed in two columns. The function is described on the left side; the **AT** commands and responses are described on the right side.

All **AT** commands start with the letters **AT** and end with a "Return" (Carriage Return - CR). **AT** commands can be entered in capital or small letters. The command is processed after the modem received a CR input.

In the following, the used syntax is described, using two examples:

AT+CPIN=<n>

Entering the PIN 1234: **at+cpin=1234**

OK

ATD<ip>:<port>+CPIN=<n>

Dialing the IP address **192.168.0.1** and the IP port **1234**

ATD192.168.0.1:1234

OK

Additional documentation

Please find a complete overview of all AT commands in the document: "AT Command Set for INSYS GSM 4.2".

The complete reference for the standard AT commands is available on request.

Software HSComm

The software HSComm is available for the configuration of the INSYS GSM. The following system requirements are necessary for HSComm:

- Windows 2000

- Windows XP

The configuration software is available for download at the following address: http://www.insys-tec.de

Technical support

Call technical support at:

➢ E-mail: insys@insys-tec.de

➢ 0941/560061

Taking back legacy systems

According to the new WEEE guidelines, the taking back and recycling of legacy systems for our clients is regulated as follows:

Please send those legacy systems to the following address, carriage prepaid:

Frankenberg-Metalle
Gärtnersleite 8
D-96450 Coburg

This regulation applies to all devices which were delivered after August 13, 2005.

2 Overview

The INSYS GSM is a terminal device according to ETSI GSM Phase 2/2+ for the transmission of the following:

- Data
- Voice
- Fax group 3
- SMS messages

In dual band GSM networks:

- Class 4 (2W @ 900Mhz)
- Class 1 (1W @ 1.800MHz)

Models

The INSYS GSM is available in two models:

- INSYS GSM 4.2

   The INSYS GSM 4.2 has an additional connection for a phone handset.
- INSYS GSM 4.2 compact

   The INSYS GSM 4.2 compact is characterized by small installation depth.

Both devices are designed for mounting on a DIN rail according to DIN EN 500 22.

Fields of application

The INSYS GMS offers several options for transmitting data via the GSM network. You may use it to implement data connections or, for example, a messaging system with pre-configured message texts.

Configuration

The INSYS GSM can be configured easily using the configuration software HSComm, or directly via AT commands.

Interfaces, Display and Control Elements

- Serial RS232 Interface
- Slot for the SIM card of a GSM provider (3 V cards)

   Miniature SIM card reader with integrated compartment
- FME antenna connection
- Audio interface (not for INSYS GSM 4.2 compact)
- Reset key
- 5 LEDs for status display
- 2 alarm inputs
- 2 digital outputs (potential-free relay switches)

The connections for the power supply, the alarm inputs, and the switch outputs are designed as terminals.

2.1 INSYS GSM 4.2
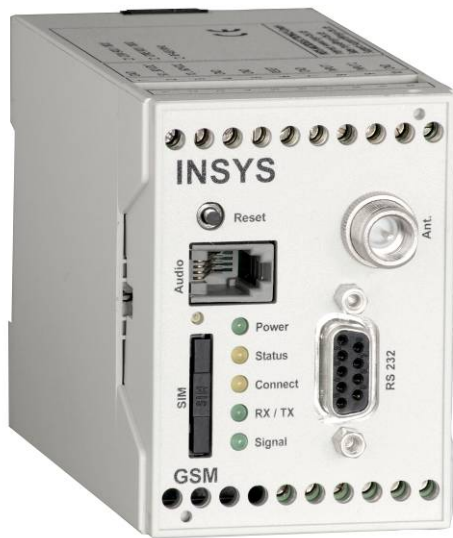
2.2 INSYS GSM 4.2 compact

2.3 Data Services

2.3.1 Data services via the serial interface

The serial interface is available for the configuration of the INSYS GSM or for the data connection to the terminal device.

The serial interface has the following characteristics:

- ➢ Interface terminal adapter (TA) – terminal station (terminal equipment, TE)
- ➢ Compatible with RS232 (V.24/V.28)
- ➢ Extended data formats (10 and 11 bit)
- ➢ Baud rates: 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200 bps

   The standard setting is 19200 bps
- ➢ No automatic baud rate adaptation (command `AT**BAUD`)

2.3.2 Data Connection via the GSM network

The INSYS GSM is designed for the system environment of mobile networks with 900 MHz and 1800 MHz according to ETSI GSM phase 2/2+. Accessing a GSM network requires a SIM card of a network provider.

The data connection has the following characteristics:

- ➢ Non-transparent asynchronous
- ➢ V.22bis (2,400 bps)
- ➢ V.32/V.33/V.34 (4800/9600/14400 bps)
- ➢ V.110 (2400/4800/9600/14400 bps)

The INSYS GSM masters the following data services. The support of some data services in the GSM network depends on the GSM provider.

- ➢ Data connection
- ➢ Voice connection

   HR, FR, EFR
- ➢ Fax transparent

   Group 3: Class 1 and Class 2
- ➢ SMS services

2.4 Additional Functions

The INSYS GSM provides the following:

- ➢ Integrated real time clock (RTC)
- ➢ Event memory (history function) with 200 entries
- ➢ Flash update option (local or remote)

The INSYS GSM offers the following functions:

Security and Access Protection

- ➢ Password protection for

- o Incoming data connections
- o Security callback
- o Commands via SMS
- o Operation via DTMF
- o Remote configuration
- ➢ Selective call acceptance (CLIP)

Connection Setup and Monitoring

- ➢ Periodic alive SMS for operation monitoring

- ➢ After any power failure that lasts a minimum of 5 seconds (not reset), the IN-SYS GSM can send a power up SMS.

- ➢ Automatic re-login into the GSM network after power failures
- ➢ Scheduled logout/login into the GSM network

Control via AT commands

- ➢ Locally (via terminal)
- ➢ Remotely (only extended command set)
- ➢ Via SMS (only extended command set)

Alarm input

- ➢ Usage as alarm or pulse input with 10 different pulse sequences
- ➢ Sending alarm messages via SMS, fax, e-mail and via data connection, or establishing a voice connection
- ➢ Additional dispatch of the alarm message to up to 10 further recipients from a pool of 20 numbers
- ➢ Switching a switch output

Switch output

- ➢ Control outputs (relay switches)
- ➢ Controllable via
  - o Alarm input, RING, GSM network failure
  - o AT command, locally and remote
  - o SMS command
  - o DTMF tone

2.5 Technical Data

2.5.1 Mechanical characteristics

	INSYS GSM 4.2	INSYS GSM 4.2 compact
Weight	270 g	218 g
Dimensions in mm (w x l x h)	55 x 110 x 75	82 x 58 x 84
Protection class cover front	IP 40	IP 40
Protection class terminals	IP 20	IP 20

2.5.2 Power supply

The INSYS GSM requires a power supply of 10 to 60 V (DC) at a maximum of 5% ripple.

!   **Caution - No overvoltage protection!**
The INSYS GSM does not have a fuse.
Surges and excessive voltages may result in the destruction of the device.

The following table shows the values that were determined for a signal field strength of 20 (`AT**SIGNAL?`). The current consumption and therefore the power consumption may increase during poor network conditions.

These are average values for estimating the current consumption.

►   **Note**
Use a power supply unit that is capable of supplying up to 10 W at short notice (577 µs) to ensure proper operation.

	State: Logged into the GSM network	State: Connection established
Current consumption type at 10 V (DC)	170 mA	245 mA
Current consumption type at 24 V (DC)	90 mA	110 mA
Current consumption type at 36 V (DC)	55 mA	70 mA
Power consumption approx.	1.7 W	2.1 W

2.5.3 Serial interface RS232 (V.24)

Pin layout of the serial interface RS232, 9-pin SUB-D connector with threaded joint:

Pin	Description	Function	CCITT V.24	EIA RS232	DIN 66020	E/A DCE to DTE
1	DCD	Data Carrier Detect	109	CF	M5	O
2	RXD	Receive Data	104	BB	D2	O
3	TXD	Transmit Data	103	BA	D1	I
4	DTR	Data Terminal Ready	108	CD	S1	I
5	GND	Ground	102	AB	E2	
6	DSR	Data set ready	107	CC	M1	O
7	RTS	Request to send	105	CA	S2	I
8	CTS	Clear To Send	106	CB	M2	O
9	RI	Ring Indication	125	CE	M3	O

2.5.4 SIM card

For the data connection to the GSM network, the INSYS GSM requires a SIM card from a GSM provider. The SIM card is the identification towards the network provider.

The slot for the SIM card is on the front of the INSYS GSM.

▶ **Notes:**
  ➢ Only 3V cards may be used.
  ➢ Changing the SIM card is only permitted when the device is switched off.

The GSM provider has to enable the requested services for the SIM card. A card can be enabled for both voice and data services at the same time. The following cards and contracts are normally available:

Function	Prepaid card	Contract for voice transmission	Contract for data transmission
Outgoing data connection	✓	✓	✓
Incoming data connection	-	-	✓
SMS	✓	✓	✓
Voice connection	✓	✓	-

▶ **Note**
  Generally, different phone numbers are assigned to the different services (voice, data connections with 2400, 4800 and 9600 bps). The GSM network does not switch a data call to a phone number for voice connections, for example.

2.5.5 Audio interface (not for INSYS GSM 4.2 compact)

Pin layout, 4-pin RJ45 phone plug:

Pin	Usage
1	Microphone (-)
2	Speaker (-)
3	Speaker (+)
4	Microphone (+)

Reference type: Handset Siemens-Gigaset

2.5.6 Antenna interface

The antenna connector at the front of the INSYS GSM has the type FME (male).

All commercial GSM antennas with a female FME connector can be used as antennas.

Ensure that the frequency band corresponds with the one of the provider when using single band antennas (900 MHz or 1800 MHz).

2.5.7 Digital inputs and outputs

Alarm input

The alarm inputs are designed as pull-up and are on HIGH in inactive, open state. The alarm inputs are activated by connecting to ground.

LOW	Active	0 to 1 V
HIGH	Inactive	4 to 12 V

The input current from LOW to internal +5 V is typically 0.5 mA.

Switch output

The switch outputs are potential-free relay switches.

maximum switch voltage:	30 V (DC)	42 V (AC)
maximum current load:	1 A (DC)	0.5 A (AC)

2.5.8 Terminal Layout

Top

	Terminal	
1	GND	Ground
2	X1	Reserved
3	10..60V DC	Supply 10V - 60V DC
4	GND	Ground
5	GND	Ground
6	Reset	Reset
7	GND	Ground
8	Input 1	Alarm input 1
9	Input 2	Alarm input 2
10	GND	Ground

INSYS GSM 4.2   INSYS GSM 4.2 compact

Bottom

	Terminal	
11	OUT 1-NC	Output 1 – normally closed
12	OUT 1	Output 1
13	OUT 1-NO	Output 1 – normally open
14	OUT 2-NC	Output 2 – normally closed
15	OUT 2	Output 2
16	OUT 2-NO	Output 2 – normally open

INSYS GSM 4.2   INSYS GSM 4.2 compact

2.6 Environmental Conditions

The following environmental conditions must be observed for the INSYS GSM.

! **Caution - Wet environment!**
The INSYS GSM may not be used in wet environments.

	INSYS GSM
Humidity	0 - 95% non-condensing
Temperature range	0°C to 55°C

2.7 Certifications

The INSYS GSM bears the CE symbol of conformity. This symbol is a declaration that because of its design and implementation, the INSYS GSM complies with the currently valid versions of the following EC directives:

Directives:	89/336/EEC (EMC directive) 73/23/EEC (Low voltage directive) 91/263/EEC (Telecommunications devices directive)
Standards:	ETS 300 342 1 EN 60950 EN 55022 (class B) EN 55024 EN 300 607-1 EN 301 419-1 EN 3015011 V7.01 TBR 19, TBR 20
Approvals:	CE

2.8 Interfaces, Display and Control Elements

The INSYS GSM has 5 LEDs for status displays and one reset key on the front.

2.8.1 Display elements

Each INSYS GSM has 5 LEDs on the front.

LED	Color	On	Off	Blinking	Flashing
Power	Green	Supply OK	No supply		
Status	Yellow	GSM engine logged into network*	GSM engine not logged into network*	Data connection Alternate blinking with LED Connect, or LED DCD: Factory settings loaded	Initialization, Processing of alarms, Dispatch of periodic alive SMS, SMS polling and power up SMS
Connect (only INSYS GSM 4.2) DCD (only INSYS GSM 4.2 compact)	Yellow	Data connection established	No data connection established	Alternate blinking with LED state: Factory settings loaded	
RX/TX	Green	Exchange of data via RS232	No data exchange		
Signal	Green	Best GSM signal (field strength)*	GSM signal (field strength) too low*	Blinking interval depending on GSM signal (field strength)*: The higher the blinking frequency, the better the signal. (see Chap. 3.9) Blinking in intervals of seconds during the flash update	

*) The periodical query of the login state and the GSM field strength must be active (command `AT**GSMREQ`).

2.8.2 Reset key

Use the reset key to re-initialize the INSYS GSM or to load the factory settings.

Procedure: Reset

1. Press the reset key briefly.

   The device is returned to its initial state. This process takes approximately 30 seconds. The LED **Status** blinks during this period.

This corresponds to the command **AT**RESET**.

Procedure: Load factory settings

1. Press the reset key more than 25 seconds.

2. When the LEDs **Connect** or **DCD** and **Status** blink alternately you may release the reset key.

   The device executes a restart. If the pin of the SIM card has been saved, it is kept.

This corresponds to the command **AT**DEFAULT**.

3　Initial Operation

3.1　Check the scope of delivery

Check the scope of delivery before initial operation:

➢ INSYS GSM 4.2 or INSYS GSM 4.2 compact

➢ 9-pin serial cable for the connection between the PC and the INSYS GSM 232 (RS232 cable)

➢ Printed manual (German/English).

The latest editions of the manual and the AT command set are available for download at our website: http://www.insys-tec.de.

Contact your supplier if the content is not complete.

Optional accessories:

➢ GSM antenna (outside mounted antenna, patch antenna or magnetic base antenna)

➢ CD with configuration software HSComm (free) and manuals.

The configuration software is also available for download at our internet site: http://www.insys-tec.de.

Check the device for shipping damage. Please also refer to your supplier if anything is damaged.

Keep the packaging material for dispatch or storage.

3.2　Installation Overview

The following image shows the installation overview using the INSYS GSM 4.2 as example.
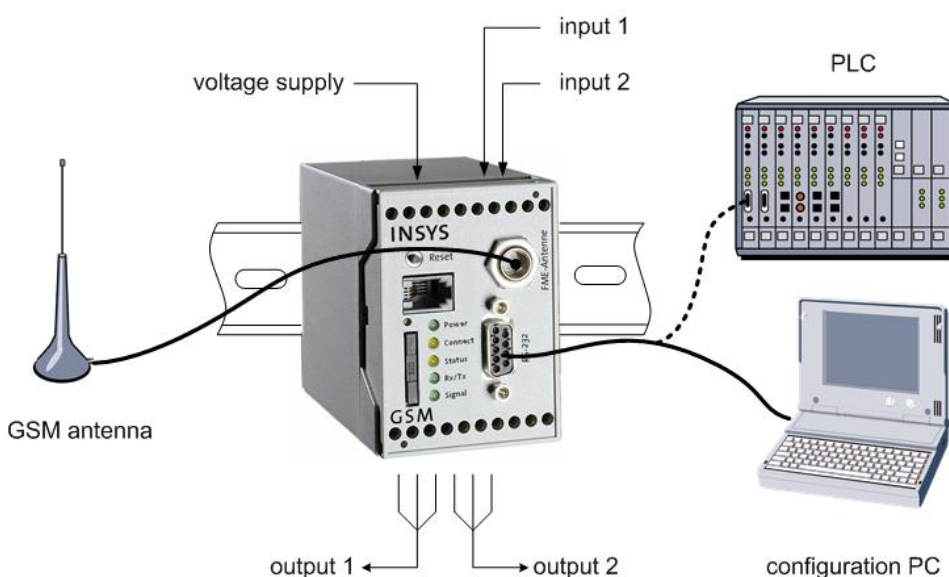
The serial interface (RS232) of the INSYS GSM and the configuration PC are connected for initial operation and configuration.

For data communication during operation, connect the terminal device with the application (e.g. a PLC) via the serial interface with the INSYS GSM (dashed line).

3.3   Implementation Overview

The following steps are required for the implementation:

1.   Switch the device on and test it.
2.   Initial configuration using HSComm or **AT** commands.
3.   Insert the SIM card.
4.   Restart

3.4   Switch the Device on and Test it

1.   Connect the INSYS GSM and the PC using the serial cable.
2.   Connect the GSM antenna.
3.   Connect the power supply at the terminals 10..60 VDC and GND.

> **!**   **Caution - Damage of components!**
> The given values are maximum values.

4.   Switch the power supply on.
      The LED **Power** will light up.

The INSYS GSM starts the initialization.

1.   LED **Connect** or LED **DCD** light up for approx. 4 seconds.
2.   After 8 more seconds the LED **Status** starts to flash for approx. 20 seconds.
3.   Afterwards, the LED **Status** goes out because no SIM card is inserted and no PIN is stored.
4.   The LED **Signal** is on or blinks depending on the strength of the GSM network.

      The device is operational.

If the INSYS GSM does not perform an initialization or the LED **Power** is not on, refer to your supplier.

3.5   Initial Configuration

You can perform the initial configuration as follows:

- ➢ User-friendly with the configuration software HSComm under Windows.
- ➢ By directly entering **AT** commands in a terminal program.

  Suitable terminal programs: TeraTerm, HyperTerminal, or the HSComm terminal window.

3.5.1 Initial configuration via HSComm GSM

> **Warning!**
>
> *The AT command sets of the current INSYS GSM and the prior version INSYS GSM 2.0 are not identical:*
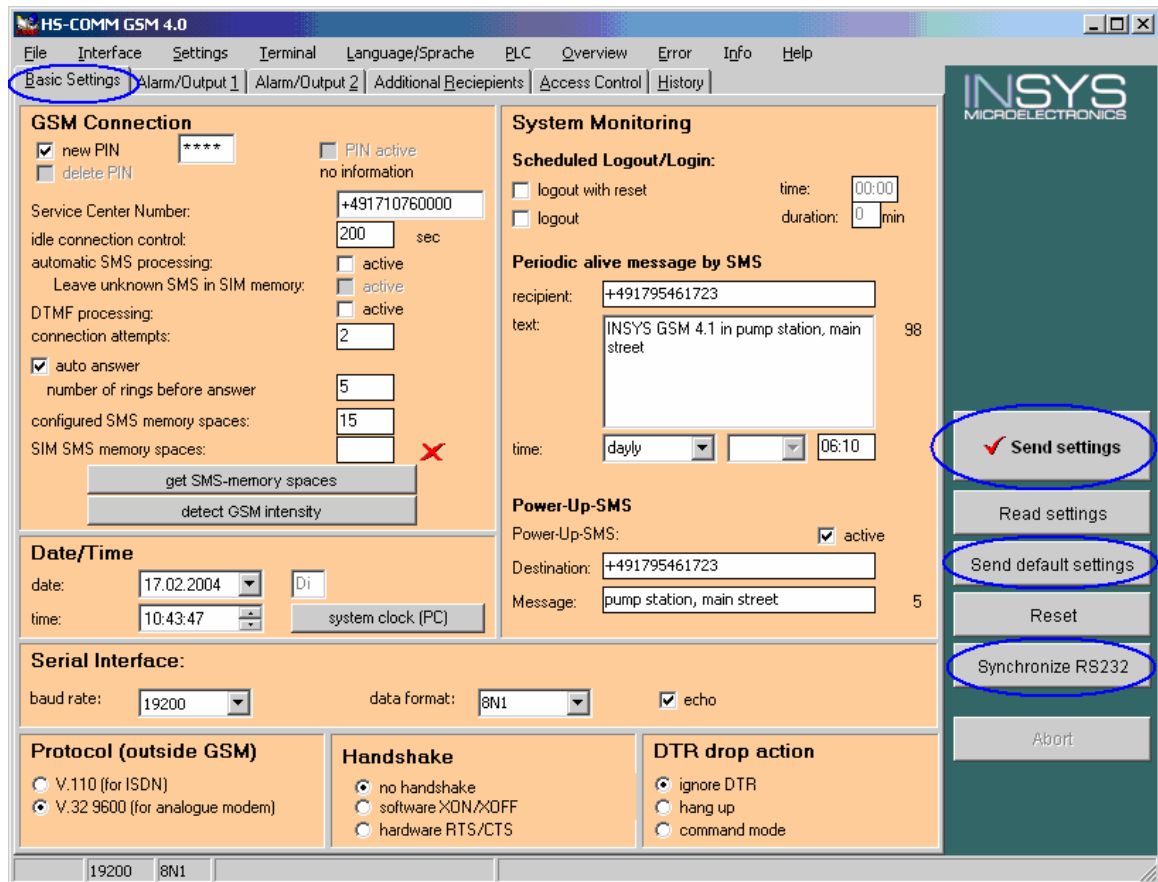>
> - ➢ *Use the HSComm GSM version 4.6.1.15 or higher for INSYS GSM 4.2.*
> - ➢ *Use the HSComm GSM version 2.0.6.1 for INSYS GSM 2.0.*

You can perform the initial configuration alternatively with AT commands as described in the following chapter.
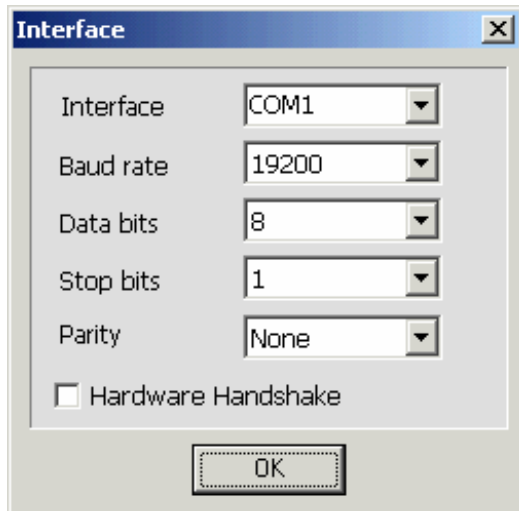
1. Start the program HSComm under Windows.

The configuration software is started and displays the tab "Basic settings".

2. Select the following standard setting for the serial interface in the menu "Interface" at the configuration PC:

3. If the INSYS GSM is in an undefined state, reset it first optionally to the factory settings using the button "Send default settings").

4. If the INSYS GSM does not respond to the transmission of commands, select the button "Synchronize RS232" to adapt the baud rate and the data format automatically.

5. In the tab "Basic settings" enter the PIN of the SIM card in the group "GSM connections" in the entry field "New pin.

   The PIN is stored in the INSYS GSM and is used for logging into the GSM network at every restart.

6. Send the setting using the button "Send values".

7. Check the field strength of the GSM signal using the button "Read field strength now in the tab "Basic settings" in the group "GSM connection".

   The field strength is displayed:
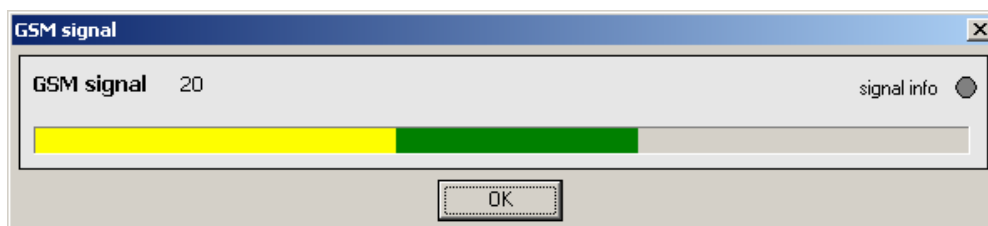
   The GSM signal should have a field strength of at least 12. (see Chap. 3.9)

   For lower values or the value 99 you will need to change the antenna location.

   ▶ **Note**
   After changing the antenna location, wait 5 to 10 seconds. Only now will the INSYS GSM display the field strength correctly.

3.5.2 Initial configuration with AT commands

You can perform the initial configuration alternatively with the software HSComm as described in the previous chapter.

1.   Start your terminal program or the terminal window of HSComm.

2.   Set the serial interface settings to the standard values: 19200 baud, 8 data bits, 1 stop bit, no parity:

AT**BAUD=19200

AT**FORMAT=8N1

3.   If the INSYS GSM is in an undefined state, reset it optionally to the factory settings first:

AT&F&WZ

AT**DEFAULT

4.   Enter the PIN.

Example: Entering the PIN 1234:

AT**PIN=1234

If the PIN of the SIM card is deactivated, enter only **AT**PIN=**.

5.   Check the field strength of the GSM signal: (see Chap. 3.9)

AT**SIGNAL?

The GSM signal should have a field strength of at least 12.

For lower values or the value 99 you will need to change the antenna location.

▶   **Note**
After changing the antenna location, wait 5 to 10 seconds. Only now will the INSYS GSM display the field strength correctly.

3.6 Restart

For the restart, you must insert the SIM card and restart the device. The device will reinitialize and login into the GSM network.

3.6.1 Procedure: Insert SIM card

Switching the SIM Card

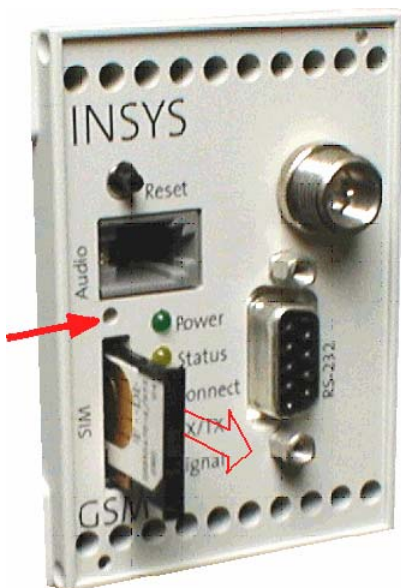Prior to switching the SIM card, you must change or delete the PIN before inserting the new SIM card.
Otherwise, the SIM card will be blocked after three unsuccessful login attempts.

▶ **Notes:**
  ➢ Only 3V cards may be used.
  ➢ Changing the SIM card is only permitted when the device is switched off.

The slot for the SIM card is on the front of the INSYS GSM.

Unlocking the card reader – Example INSYS GSM 4.2:

1. Turn the power supply off.

2. To unlock the cardholder, press the sunken, yellow button on the card reader.

3. Remove the cardholder.

4. Insert the SIM card into the cardholder with the contacts facing upwards.

5. Push the cardholder back into the card reader (contacts of the SIM card to the left), until the cardholder is flush with the housing top.

6. Turn the power supply on.
   The INSYS GSM starts the initializing process.

Initialization:

1.   LED `Connect` or LED `DCD` light up for approx. 4 seconds.

2.   After 8 more seconds the LED `Status` starts to flash for approx. 20 seconds.

When the device has successfully logged in, the following LEDs will light up:

> ➢ LED `Power`
> ➢ LED `Status`
> ➢ The LED `Signal` displays the strength of the GSM signal.

3.7   Connection Test

After this successful initial configuration, you can easily check whether your INSYS GSM is connected with the GSM network:

Dial the number of a phone connection (e.g. your mobile phone) from the terminal window of the HSComm or from your terminal program.

Dialing a telephone   `ATD <n>`

`<n>` e.g. Number of your mobile phone

The ringing will indicate that the INSYS GSM is attempting to establish the connection.

> ▶   **Note**
>   Make sure that your SIM card is enabled for incoming data connection if required (see Chap. 2.5.4).

3.8   Causes of Error during Implementation

INSYS GSM does not react to commands

Possible cause:

➢ The settings of the serial interface of the INSYS GSM and the terminal device do not match.

Remedy:

➢ In the HSComm, synchronize the RS232 interface using the button "Synchronize RS232".

➢ Adjust the settings.

➢ Reset the INSYS GSM to the default factory settings by pressing the reset key for a prolonged period.

> ► **Note**
>
> If possible, use the serial interface directly. Problems during data transmission may occur when USB serial converters are used.

No connection to the GSM network

Possible causes:

➢ The signal quality of the GSM network is not sufficient. (see Chap. 3.9)

➢ The INSYS GSM is not logged in. (see Chap. **Fehler! Verweisquelle konnte nicht gefunden werden.**)

➢ The SIM card is not authorized for data connection. (see Chap. 2.5.4)

➢ The phone number is not selected or not correctly selected.

➢ The power supply for connections is not sufficient. (see Chap. 2.5.2)

3.9   Testing the Signal Quality

The signal quality at the INSYS GSM location can be tested as follows:

➢ Use the button "Read GSM field strength now" on the tab "Basic settings" in the group "GSM connection" of the software HSComm.

➢ Use the AT command **AT**SIGNAL?**

The GSM signal should have a field strength of at least 12.

For lower values or the value 99 you will need to change the antenna location.

The value 99 means that the field strength can not be ascertained. This occurs during network loss or if an antenna is damaged, for example.

The signal quality is indicated with an update interval of 1 minute (in idle state) by the LED **Signal**:

Blinking interval LED signal	Response from AT**SIGNAL? or Read field strength now (HSComm)	Signal quality
Always on	25 .. 31	Optimum
16.7 Hz	23 .. 24	Very good
7.1 Hz	21 .. 22	
3.8 Hz	19 .. 20	Good
2.6 Hz	17 .. 18	
2 Hz	15 .. 16	Sufficient
1 Hz	13 .. 14	
Always off	0 .. 12	Not sufficient ➜ Improve location
	99	Not detectable

▶ **Note**

After changing the antenna location, wait 5 to 10 seconds. Only now will the INSYS GSM display the field strength correctly.

3.10   Checking the PIN and the Login State

To check the login state in the GSM network, proceed as follows:

1.   Check the PIN.
2.   Check the login state.

Checking in the HSComm

To check if the SIM card of the INSYS GSM and the entered PIN were accepted, proceed as follows:

Under the control box "Pin active" in the tab "Basic settings" in the group "GSM connection" of the HSComm, the validity of the PIN and the login state are displayed in plain text.

If required, enter the Pin (see Chap. 3.5.1) or the PUK (see Chap. 0).

Checking the PIN using an AT command

1.   Enter the command **AT+CPIN?** in the terminal program.

     The following responses are possible:

READY	No input required
SIM PIN	SIM card PIN missing
SIM PUK	PUK entry required (after repeated false PIN entries)
+CME ERROR: SIM not inserted	SIM card is not inserted or not correctly inserted

2.   If required, enter the Pin (see Chap. 6.1.1) or the PUK (see Chap. 0).

3.   If the command AT+CPIN? sent the response *READY*, enter the command **AT+CREG?** to query the login state.

     The response will be as follows, for example:

     <+CREG: 0.3>

     The status of the login state is indicated by the 2nd parameter of the response (in the following: "3" = rejected).

Overview of responses

The following table shows the possible responses for the validity of the PIN and the login state.

Response AT+CPIN?	Response HSComm (Tab "Basic settings")	Meaning
SIM READY		No further input required
SIM PIN	"SIM PIN missing"	The SIM card PIN is not known.
SIM PUK	"SIM PUK missing"	A wrong PIN has been entered repeatedly and is blocked.
+CME ERROR: SIM not inserted		SIM card is not inserted or not correctly inserted in the INSYS GSM.
Response from AT+CREG?		
0	"GSM: Not logged in"	Not logged in, no GSM network search
1	"GSM: Logged in"	Logged in at the standard provider
2	"GSM: Network search"	Not registered, GSM network search
3	"GSM: Rejected"	Rejected
5		Logged in, roaming

Entering the PUK

When the wrong PIN is entered repeatedly, it will be blocked. To unlock, the PUK, which you find in the contract documents of your GSM provider is required.

▶ **Note**

We recommend entering the PUK with the help of a mobile phone.

Procedure: Enter the PUK

1. Remove the SIM card from the INSYS GSM.
2. Insert the SIM card into a common mobile phone.
3. Enter the PUK via the menu.
4. You must ensure that the correct PIN is stored in the INSYS GSM.
5. Re-insert the SIM card in to the INSYS GSM.

4 Operating Modes

You can operate the INSYS GSM in the following three operating modes:

- ➢ Connection mode (online)
- ➢ Command Mode
- ➢ Alarm State

> ▶ **Note**
> The configuration mode of previous versions is no longer in use since the integration of the extended INSYS **AT**** commands.

4.1 Connection mode (online)

In connection mode, the asynchronous byte stream between the serial interfaces of the INSYS GSM and the remote terminal is exchanged transparently.

During an existing data connection, you can put the INSYS GSM into the following states:

- ➢ Locally into command mode using the escape sequence **+++**
- ➢ Via the data connection into remote configuration mode using the escape sequence *******

> ▶ **Note**
> The escape sequence activates the command mode.

Example for the design of a connection and for switching into command mode

Dials the number to which a connection is to be set up (always with dialing code). Only for voice connections, the phone number must end with a semicolon.	`ATD015265241`
While the other phone rings, the cursor is displayed.	
The call has been accepted. Data is exchanged over the GSM network.	`CONNECT 9600/RLP`
Changing from data mode to online AT command mode. The connection still remains, but no characters are transmitted to the other modem anymore.	`+++`
Hang up (terminate connection to the other party)	`ATH`
Return to data mode	`ATO`
The other party has terminated the connection	`NO CARRIER`

Connections can be terminated as follows:

➢ Manually by the **ATH** command in online command mode

➢ If the remote terminal hangs up

➢ By idle connection control

➢ By activating an alarm input

➢ By DTR drop

4.2 Command Mode

4.2.1 Offline command mode

The offline command mode is the state after switching on or resetting the INSYS GSM. You can address the INSYS GSM during offline command mode using AT commands.

4.2.2 Online command mode (local)

During a data connection, you can put the INSYS GSM into online command mode by entering the escape sequence via the serial interface.

Requirements:

The data communication is perhaps active.

There has been no data traffic for at least one second.

Entering the escape sequence:

1. Swiftly enter the characters +++ (without <CR>).

2. Wait at least one second.

   The response *OK* is displayed.

   The device is in command mode.

3. Wait two more seconds before entering **AT** commands.

The data connection will remain established. You can terminate the data connection by entering **ATH**. The INSYS GSM changes back to connection mode with **ATO .**

4.2.3 Remote configuration

During a data connection, you can put the INSYS GSM into remote configuration mode via the data connection by entering the escape sequence at the remote terminal.

Requirements:

> The data communication is perhaps active.

> There has been no data traffic for at least one second.

Entering the escape sequence:

1. Swiftly enter the characters `***` (without <CR>).

2. Wait at least one second.

> The device is in command mode.

The data connection remains established, while the entered extended `INSYS AT**` commands are processed at the remote INSYS GSM. The INSYS GSM changes back to connection mode with `AT**EXIT.`

If it has been set, the remote configuration password is queried before changing to the remote configuration mode.

4.2.4 SMS configuration

You can also send the extended `INSYS AT**` commands to the INSYS GSM via SMS. (see Chap. 6.2.4)

The commands sent via SMS will be executed as soon as the INSYS GSM is in command mode.

4.3 Alarm State

As soon as an alarm input of the INSYS GSM has been activated, existing data and voice connections are terminated. Incoming commands are ignored during the processing of the alarm actions. If an input is activated while processing an alarm at the other input, the second alarm state is saved and executed subsequently.

If an connection cannot be established, a re-dial is attempted after one minute until the defined maximum number of dial-up attempts is reached. (see Chap. 6.1.3)

The LED `Status` is flashing during the (attempted) connection set-up.

4.4   AT Commands for Switching into another Operating Mode

`***`	Activate remote configuration mode
`+++`	Activate online command mode
`ATD`	Establish a connection
`ATH`	Terminate connection
`AT**EXIT`	Exit remote configuration mode
`ATO`	Exit online command mode
`AT**PASSC`	Password for remote configuration
`AT**ESC`	Escape character for remote command mode

5 Configuration Software HSComm GSM

The software HSComm provides the opportunity to configure the INSYS GSM under Windows without explicit knowledge of the AT commands.

The free configuration software HSComm can be downloaded at: http://www.insys-tec.de.

Warning!

The AT command sets of the current INSYS GSM and the prior version INSYS GSM 2.0 are not identical:

➢ *Use HSComm GSM version 4.6.1.15 or higher for INSYS GSM 4.2*

➢ *Use HSComm GSM version 2.0.6.1 for INSYS GSM 2.0*

5.1 Help

The context sensitive help is available any time via the key **F1** or the "Help" menu.

Help also contains the complete command reference for the extended INSYS AT commands.

5.2   HSComm User Interface

The HSComm GSM user interface provides menus, registries and buttons, which are described with their mode of operation in the current chapter. The according chapters of "Functions and their configuration" will show how to configure the individual functions.

5.2.1 Menus

The HSComm GSM includes the following menus:

File

Use the menu item "File" to save the current settings as shown in the HSComm user interface as a file, or to re-read the settings.

Interface

Use the menu item "Interface" to set the serial interface of the configuration PC.

▶ **Note**

The interface parameters of the configuration PC must match the interface parameters of the INSYS GSM.

Program settings

Automatic detection at program start

When "Automatic detection at program start" is activated, the HSComm detects the IN-SYS GSM as soon as it is connected. The device is immediately read out. The button "Read values" need not be activated.

Advanced logging

Acticate "Advanced logging" to create a log if errors occur during the configuration. You can open the protocol at the menu item "Send and receive protocol".

Terminal

In the terminal window you can send **AT** commands directly to the INSYS GSM.

Language

Use the menu "Language" to switch between the interface languages German and English.

PLC

The INSYS GSM has been tested for the most common PLC systems on the market.

You can adjust the default settings for the initialization and communication strings. Changes will not be saved.

Overview

Use the "Overview" to display all current HSComm settings transparently. The output extends over several screen pages.

You may save the overview as text file.

▶ **Note**

Have the overview available when you call the hotline!

Send/receive log

See advanced logging at the menu item "Program settings".

5.2.2 Buttons

Use the buttons to start data transmissions between the INSYS GSM and the configuration PC. During the data transmission, a progress bar will be displayed above the buttons.

Send settings

Use the button "Send values" to transmit the current settings in the HSComm to the IN-SYS GSM.

▶ **Note**

The settings for the menu item PLC may only be transmitted using the buttons "Configure GSM device at the PLC" or "Configure PC modem".

Read settings

Use the button "Read settings" to read the current settings from the INSYS GSM. The current settings are displayed in the HSComm.

Send default settings

Use the button "Send default values" to load the default factory settings into the INSYS GSM. A reset will be executed.

If the PIN was stored, the device will immediately afterwards log into the GSM network.

Reset

Use the button "Reset" to start a reset of the INSYS GSM.

If the PIN was stored, the device will immediately afterwards log into the GSM network.

Synchronize RS232

The serial interfaces of the INSYS GSM and the configuration must be configured equally.

Use the button "Synchronize RS232" to test all possible baud rate and data format settings at the PC side until both sides match.

Abort

Use the button "Cancel" to cancel running data transmissions, e.g. for "Send values" or "Read settings".

5.2.3 Status bar

The status bar at the lower window border of the HSComm displays the setting and activities of the serial interface of the configuration PC.

The LEDs RX and TX of the INSYS GSM light up synchronously during the receiving and sending of data.

5.2.4 Tabs

The settings of the basic and extended settings are spread across several tabs, which can be selected via the tab titles.

| Grundeinstellung | Alarm/Schalten 1 | Alarm/Schalten 2 | weitere Empfänger | Zugriffschutz | Historie |

The settings will be transmitted to the INSYS GSM when you click on the button "Send values".

The functions are described in detail in the chapter "Functions and their configuration".

5.3 HSComm User Interface

The HSComm GSM user interface provides menus, registries and buttons, which are described with their mode of operation in the current chapter. The according chapters of "Functions and their configuration" will show how to configure the individual functions.

5.3.1 Menus

The HSComm GSM includes the following menus:

File

Use the menu item "File" to save the current settings as shown in the HSComm user interface as a file, or to re-read the settings.
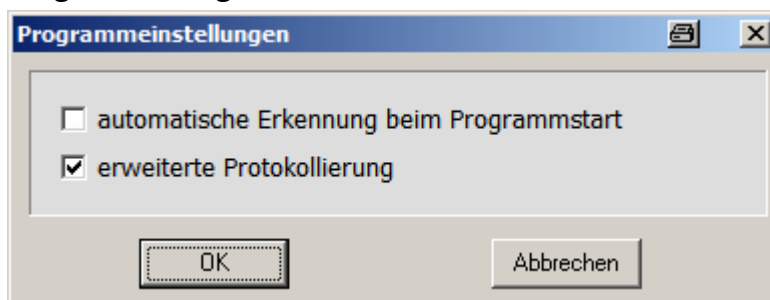
Interface

Use the menu item "Interface" to set the serial interface of the configuration PC.

▶ **Note**

The interface parameters of the configuration PC must match the interface parameters of the INSYS GSM.

Program settings

Automatic detection at program start

When "Automatic detection at program start" is activated, the HSComm detects the IN-SYS GSM as soon as it is connected. The device is immediately read out. The button "Read values" need not be activated.

Advanced logging

Acticate "Advanced logging" to create a log if errors occur during the configuration. You can open the protocol at the menu item "Send and receive protocol".

Terminal

In the terminal window you can send `AT` commands directly to the INSYS GSM.

Language

Use the menu "Language" to switch between the interface languages German and English.

PLC

The INSYS GSM has been tested for the most common PLC systems on the market.

You can adjust the default settings for the initialization and communication strings. Changes will not be saved.

Overview

Use the "Overview" to display all current HSComm settings transparently. The output extends over several screen pages.
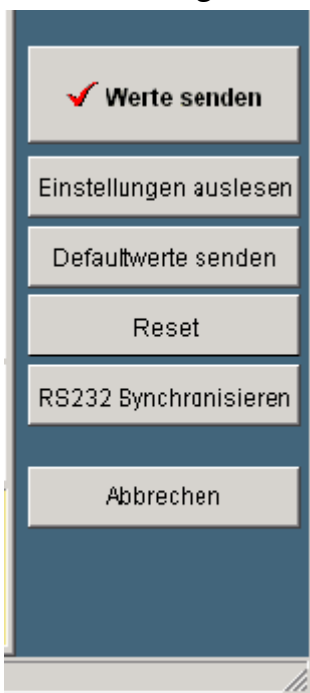
You may save the overview as text file.

▶ **Note**

Have the overview available when you call the hotline!

Send/receive log

See advanced logging at the menu item "Program settings".

5.3.2 Buttons

Use the buttons to start data transmissions between the INSYS GSM and the configuration PC. During the data transmission, a progress bar will be displayed above the buttons.

Send settings

Use the button "Send values" to transmit the current settings in the HSComm to the IN-SYS GSM.

▶   **Note**

The settings for the menu item PLC may only be transmitted using the buttons "Configure GSM device at the PLC" or "Configure PC modem".

Read settings

Use the button "Read settings" to read the current settings from the INSYS GSM. The current settings are displayed in the HSComm.

Send default settings

Use the button "Send default values" to load the default factory settings into the INSYS GSM. A reset will be executed.

If the PIN was stored, the device will immediately afterwards log into the GSM network.

Reset

Use the button "Reset" to start a reset of the INSYS GSM.

If the PIN was stored, the device will immediately afterwards log into the GSM network.

Synchronize RS232

The serial interfaces of the INSYS GSM and the configuration must be configured equally.

Use the button "Synchronize RS232" to test all possible baud rate and data format settings at the PC side until both sides match.

Abort

Use the button "Cancel" to cancel running data transmissions, e.g. for "Send values" or "Read settings".
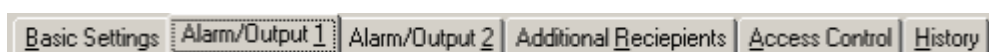
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The status bar at the lower window border of the HSComm displays the setting and activities of the serial interface of the configuration PC.

The LEDs RX and TX of the INSYS GSM light up synchronously during the receiving and sending of data.

5.3.4 Tabs

The settings of the basic and extended settings are spread across several tabs, which can be selected via the tab titles.

| Basic Settings | Alarm/Output 1 | Alarm/Output 2 | Additional Reciepients | Access Control | History |

The settings will be transmitted to the INSYS GSM when you click on the button "Send values".

The functions are described in detail in the chapter "Functions and their configuration".

6   Functions and their Configuration

The functions of the INSYS GSM can be configured easily using the configuration software HSComm, or directly via AT commands.

6.1   Procedures: Configure the basic settings

The basic settings can be configured in the Software HSComm on the tab "Basic settings".

6.1.1 GSM connection

PIN

You can save the SIM card PIN in the INSYS GSM. The INSYS GSM will automatically dial into the GSM network during startup. The default PIN setting is "0000".

To operate SIM cards without PIN, you may delete the PIN.

Switching the SIM Card

Prior to switching the SIM card, you must change or delete the PIN. Otherwise, the SIM card will be blocked after three unsuccessful login attempts.

▶ **Note**

Automatic login at restart is only possible if the PIN is stored in the INSYS GSM.

Service Center Number SCN

To send SMS, the service center number (SCN) of your own GSM provider must be entered. (see Chap. **Table: GSM - Service Center Numbers**
)

Idle detection

The INSYS GSM can terminate hanging connections, over which no data is exchanged anymore, automatically after a specified waiting period. Each character, which is sent via the serial interface (both directions), restarts the timer.

You may enter a waiting time of up to 255 seconds. To deactivate idle detection enter a waiting time of 0 seconds.

Detect field strength intensity

Use the button "Detect GSM field strength now" to read out the field strength. (see Chap. 3.9)

Query login state

The validity of the PIN and the login state are displayed under the control box "PIN active" in plain text. (see Chap. **Fehler! Verweisquelle konnte nicht gefunden werden.**)

Procedure: Configure PIN, service center number and idle detection

1. Start the program HSComm under Windows.

    The configuration software is started and displays the tab "Basic settings".

2. In the group "GSM connection", activate the control box "New PIN" and enter the new PIN in the entry field.

    ▶ **Note**

    The PIN is encrypted. The displayed character is *****.

3. To delete the PIN, activate the control box "Delete PIN" in the group "GSM connection".

4. Enter the service center number (SCN) of the GSM provider in the group "GSM connection" in the field "Service center number". Use the international format (e.g. Germany: +49...) for entering the number (see Chap. 8).

5. Enter the requested waiting time (in seconds) in the group "GSM connection" in the entry field "Idle detection".

Pertinent AT commands	
`AT**PIN`	SIM card PIN
`AT**PROVIDER`	Preferred provider
`AT**SCN`	Service Center Number
`AT**DTC`	Idle connection control (Data Transmit Controller)
`AT+CREG`	Query login state

6.1.2 DTMF tone processing

DTMF tones (e.g. from a touch-tone phone) can be used via a voice connection to query alarm inputs and to switch outputs. Requirements:

➢ The number for voice connections has been dialed.

➢ The automatic processing of DTMF tones is enabled.

Incoming voice calls are automatically accepted for enabled DTMF processing.

These functions are optionally protected with a PIN (see Chap. 6.2.2). When a PIN is set, the PIN (4 digits) has to be entered first after the connection has been established, which is acknowledged with *ERROR* or *OK*

The following commands (keys) are defined:

0*	Terminate connection
1*1	Switch output 1 to normally open
1*0	Switch output 1 to normally closed
2*1	Switch output 2 to normally open
2*0	Switch output 2 to normally closed
3*	Query of the alarm inputs: Response state input 1 – pause – state input 2

Each command is acknowledged with *OK* first. The acoustic responses have the following meaning:

	Acoustic response	Corresponding keys
OK	low (short) high (short)	* #
ERROR	low (long)	1
Input inactive (HIGH)	high (medium long)	D
Input activated (LOW)	low (medium long)	1

The following extended responses are displayed instead of RING for activated DTMF processing:

+CRING: VOICE   For voice/DTMF connections

+CRING: REL ASYNC For data connections

Procedure: Activate DTMF tone processing

> ► **Note**
> After activating DTMF tone processing, the INSYS GSM must be reset (see Chap. 2.8.2).

To activate DTMF tone processing in the software HSComm, set a check mark in the check box "Process DTMF tones" in the tab "Basic settings" in the group "GSM connection".

Pertinent AT commands	
ATDTMF**	Enable DTMF processing
ATRESET**	Device reset

6.1.3 Connection attempts

The number of connection attempts if dialing a remote terminal does not work immediately can be specified. This setting is effective for:

➢ Dispatch of messages (alarm or periodic alive SMS)

> ➢ Connection set-up for alarm messages via a data connection
> ➢ Connection set-up for security callback

Possible values are 1 to 12, default value is 3.

The dispatch will only be attempted once for an acknowledgement SMS after a configuration via SMS.

Procedure: Set number of dialing attempts

To set the number of dialing attempts in the software HSComm, enter the requested number in the tab "Basic settings" in the group "GSM connections" in the entry field "Dialing attempts".

Pertinent AT commands	
`AT**DIAL`	Dial-up attempts for periodic alive or alarm messages

6.1.4 Auto answer

After the specified number of ring tones, the INSYS GSM will accept a data call.

0   Switched off

2 to 255   On
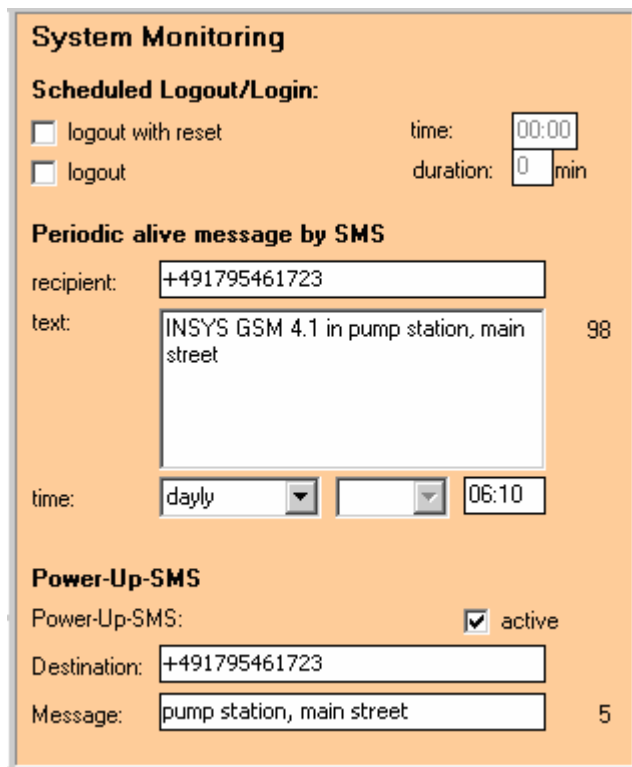
> ▶ **Note**
>
> Incoming voice calls are automatically accepted when DTMF processing is enabled.

Procedure: Activate auto answer

To activate auto answer in the software HSComm, activate the check box "Auto answer" in the tab "Basic settings" in the group "GSM connection".

Pertinent AT commands	
`ATS0`	Auto answer

6.1.5 System monitoring

System Monitoring

Scheduled Logout/Login:

☐ logout with reset   time: `00:00`

☐ logout   duration: `0` min

Periodic alive message by SMS

recipient: `+491795461723`

text: `INSYS GSM 4.1 in pump station, main street`   98

time: `dayly` ▼   ▼   `06:10`

Power-Up-SMS

Power-Up-SMS: ☑ active

Destination: `+491795461723`

Message: `pump station, main street`   5

▶ **Note**

If an alarm occurs during periodic logout/login at an external alarm input, or if a periodic alive SMS is due, the INSYS GSM will immediately re-login by itself. If the logout time has not expired yet, the INSYS GSM logs out again afterwards.

If a data connection exists, the INSYS GSM will postpone the logout procedure. A voice connection and a communication in AT command mode will interrupt the INSYS GSM immediately when logging out.

Scheduled logout and login

It is useful to log the INSYS GSM out for a short period and log in again every day to allow maintenance functions of the GSM provider. Enter the logout time and the duration (1 to 98 minutes).

Subsequently, the INSYS GSM logs in into the GSM network again, provided the PIN of the SIM card is stored.

Periodical logout/login with reset

In addition, the INSYS GSM can perform a device reset during logout/login using *Periodical logout with reset*.

After the device reset, the INSYS GSM logs in into the GSM network again, provided the PIN of the SIM card is stored.

Periodic alive message via SMS

The INSYS GSM can send a periodic alive message to the entered phone number as SMS message daily, weekly or monthly. The LED `Status` is flashing during the dispatch. (see Chap. 6.2.6)

Power up SMS

If this function is enabled, the INSYS GSM will send an SMS every time the power is inter-rupted for at least five seconds (not reset). (see Chap. 6.2.6)

The INSYS GSM will add the date and the time to the power up SMS. The date and the time will have a maximum accuracy of five minutes.

The LED **Status** is flashing during the dispatch.

Procedure: Configure system monitoring

1.   Start the program HSComm under Windows.

       The configuration software is started and displays the tab "Basic settings".

2.   To enable scheduled login/logout, activate one of the check boxes "Periodical log-out with reset" or "Periodical logout" in the group "System monitoring" and enter the requested values in the entry fields "Time" or "Duration".

                     Note

                     Enter the phone numbers in international format, e.g. Germany:
                     +49...

3.   To activate the periodic alive message via SMS, enter the requested values in the fields "Phone number", "Text" and "Time" in the group "System monitoring".

4   To enable the power up SMS, activate the check box "Power up SMS" in the group "System monitoring" and enter the requested values in the fields "Target" and "Text.

Pertinent AT commands	
AT**LOGOUT	Timer-controlled logout/re-login or device reset
AT**ALIVE	Periodic alive SMS
AT**DIAL	Dial-up attempts for periodic alive or alarm messages
AT**POWER	Power up SMS

6.1.6 Date/Time

You can set the date and the time of the real time clock of the INSYS GSM to an available time or set it to the system time of the configuration PC using the button "System time (PC)".
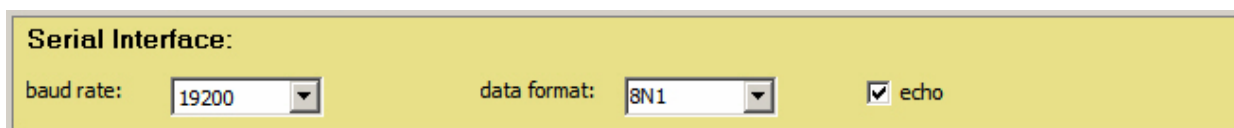
Pertinent AT commands	
AT**TIME	Time
AT**Date	Date
AT**Day	Weekday

6.1.7 Serial interface of the INSYS GSM

Set the parameters for the serial interface of the INSYS GSM in the group "Serial interface".

Select the requested values in the fields "Baud rate" and "Data format".

> **Note**
>
> The interface parameters of the configuration PC must match the interface parameters of the INSYS GSM.
> Set the serial interface of the configuration PC at the menu item "Interface".

Echo

With echo, all commands which are transmitted to the INSYS GSM via the serial interface are returned at the serial interface. This enables you to read the AT commands during terminal operation.

To enable reading the AT commands during terminal operation, activate the check box "Echo".

Pertinent AT commands	
AT**BAUD	Baud rate of the serial interface
AT**FORMAT	Data format of the serial interface
ATE	Set command echo

6.1.8 Protocol

For a data connection with a device outside the GSM network (analog modem or ISDN TA), the right protocol has to be selected. This setting is not important for data connections to a GSM device.

Enter the requested protocol in the group "Protocol (not GSM)".

6.1.9 Handshake

Handshake controls the data flow at the serial interface if the data rate is higher than what the INSYS GSM or the connected terminal device can currently process.

> ▶ **Note**
>
> You must deactivate handshake of the serial interface in the following cases:
> - ➢ The INSYS GSM is operated as a stand-alone device, i.e. it is not connected via the serial interface.
> - ➢ The INSYS GSM is operated at a device which does not support hardware handshake.

Handshake

- ⦿ no handshake
- ○ software XON/XOFF
- ○ hardware RTS/CTS
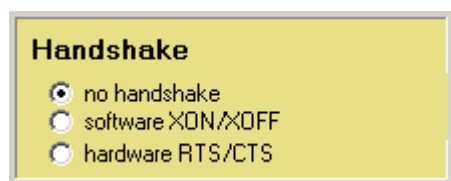
No handshake

The INSYS GSM ignores redundant data.

Software handshake

The INSYS GSM controls the data flow with the help of control characters (XON/XOFF) via the data lines.

Hardware handshake

The INSYS GSM controls the data flow via the separate control lines RTS/CTS.

Procedure: Configure handshake:

Select the requested behavior in the group "Handshake".

Pertinent AT commands	
`AT\Q`	Data flow control of the serial interface

6.1.10 DTR behavior

The control line DTR of the serial interface indicates whether a device (configuration PC, control) is connected with the INSYS GSM and is active. The setting controls the behavior when the DTR signal is missing, e.g. when the terminal device (PC, control) is disconnected.

> ▶ **Note**
>
> You must deactivate the DTR behavior of the serial interface in the following cases:

➢ The INSYS GSM is operated as a stand-alone device, i.e. it is not connected via the serial interface.

➢ The INSYS GSM is operated at a device which does not support hardware handshake.

DTR drop action

◉ ignore DTR
○ hang up
○ command mode

No DTR behavior

The INSYS GSM does not utilize the DTR signal.

Hanging up

The INSYS GSM terminates the connection, if the DTR signal is missing.

Procedure: Configure DTR behavior:

Select the requested behavior in the group "DTR behavior".

Pertinent AT commands	
AT&D<n>	Function type of the control line DTR

6.2   SMS

The INSYS GSM can send and receive SMS. During the processing of the SMS, the LED `Status` is flashing.

Incoming SMS messages are optionally protected with the remote configuration password.

The INSYS GSM can send the following SMS types:

> ➢ Alarm message
> ➢ Power up SMS
> ➢ Periodic alive message by SMS

6.2.1 Requirements for receiving an SMS

> ➢ Valid number of the SMS service center SCN (see Chap. **Table: GSM - Service Center Numbers**
> ➢)
> ➢ The INSYS GSM is logged in at the GSM network.
>   (see Chap. **If required, enter the Pin (see** Chap. 3.5.1) or the PUK (see Chap. 0).

Incoming SMS messages may be optionally protected with a password.

Pertinent AT commands	
`AT**SMSRX`	Automatic SMS reception processing

6.2.2 Receiving SMS

SMS are stored at the SMS storage locations in the SIM card. You can read out the number of all available SMS storage locations on the SIM card using the tab "Basic settings" in the HSComm software in the group "GSM connection" and the button "Locate SIM SMS storage locations now".

The INSYS GSM queries the SMS storage locations as soon as the INSYS GSM is not busy with data connections, alarm processing or processing of `AT` commands for 60 seconds.

Any activity at the serial interface (`AT` commands) restarts the query interval without executing the query. No query is made during an active data connection.

Commands entered at the serial interface are ignored.

The baud rate and the number of SMS storage locations to be configured determine the duration of the query.

Example:

Baud rate	19200 bps
Configured SMS storage locations:	15
Result:	
Query duration:	5 seconds

The number of SMS storage locations which the INSYS GSM should consider during its query routine can be set in the HSComm software in the tab "Basic settings" in the group "GSM connection" in the entry field "Configured SMS storage locations".

A problem may occur if there are more incoming SMS than SMS storage locations are queried. In this case, SMS are stored in the storage location which is not considered by the query and can therefore no longer be processed by the INSYS GSM.

▶ **Note**
When the buffer of the SIM card is full, no further SMS messages will be accepted:

Pertinent AT commands	
`AT**SMSBUF`	Specification of existing SMS storage locations in the SIM card

6.2.3 Automatic SMS processing

When you activate automatic SMS processing, the INSYS GSM will check each incoming SMS for usability and the validity of the SMS (format, password, selective call acceptance).

The INSYS GSM processes each usable SMS, sends a response, if necessary, and deletes it from the SMS memory.

SMS usable by the INSYS GSM:

➢ All SMS messages with a correct configuration password.

➢ All SMS messages with correct syntax and no configuration password.

➢ SMS messages starting with `AT**`.

➢ SMS messages which have the text "`ACKN`" as content

➢ SMS messages, where the content is an alarm message saved in the INSYS GSM (acknowledgement of alarms).

If the SMS message can not be used by the INSYS GSM, the INSYS GSM will immediately delete it from the memory. The GSM engine is operated in the operation mode `AT+CMGF=1` (SMS text mode).

SMS processing through the application

The INSYS GSM will not delete unknown SMS messages if in the HSComm software in the tab "Basic settings" in the group "GSM connection" the check box "Leave remote SMS in SIM buffer" is marked. End device applications can therefore use these SMS messages. (Operating mode `AT**SMSRX=2`),

The SMS which are not processed by INSYS GSM stay in the buffer of the SIM card until they are retrieved by the application via the serial interface, and deleted.

▶ **Note**
When the buffer of the SIM card is full, no further SMS messages will be accepted:

Suggested solution for buffer overflow:

1.   Assign a configuration password.

The INSYS GSM can then edit and delete all SMS messages with this password. The application can edit and delete all other SMS messages.

2.   Select a query cycle of the application that is larger than the one of the INSYS GSM (e.g. factor 2-3). Otherwise the INSYS GSM will re-trigger its query cycle every time the application is queried (= activity at the RS232 interface).

> ▶ **Note**
> If the query cycle is triggered frequently, for example due to activity at the RS232 interface, this may result in the INSYS GSM being no longer able to start a query of the SMS input buffer.

Procedure

To activate automatic SMS processing in the software HSComm, set a check mark in the check box "Automatic SMS processing" in the tab "Basic settings" in the group "GSM connection".

Pertinent AT commands	
AT**SMSRX	Automatic SMS reception processing

6.2.4 Commands via SMS

Most of the extended AT** commands as well as commands for switching the outputs and querying the alarm inputs can be transferred via SMS to the INSYS GSM. Responses can be sent back via SMS to a user-defined number.

Syntax for extended AT commands via SMS:

[<password>,]<command>[,CN: <reply>]

Meaning:	Parameters:
Password for remote configuration and SMS query. If no password is set, the separating comma is dropped also.	**<password>**
Extended **AT**** command with parameters	**<command>**
Optional phone number, to which the response is sent via SMS. After "**CN:**" a space character must be entered.	**<reply>**

Examples for switch outputs / alarm inputs:

[Password], AT**OUT1=1[,CN: +491601498456]

The switch output 1 is switched to normally open.

6.2.5 SMS acknowledgement

An SMS in the format of a command SMS, which contains only the text **ACKN** instead of an AT** command after the password, is entered with a time stamp and a phone number in the history list, if automatic SMS processing is enabled.

An alarm message that is received as SMS may be acknowledged by sending it back to the INSYS GSM.

6.2.6 Requirements for sending an SMS

➢ Valid number of the SMS service center SCN (see Chap. **Table: GSM - Service Center Numbers**

➢)

➢ Valid recipient number

➢ For alarm messages: The text is defined.

➢ The INSYS GSM is logged in at the GSM network.

▶ **Note**
In the following cases the handshake of the serial interface (see Chap. 6.1.9) and the DTR behavior (see Chap.6.1.10) must be deactivated:

➢ The INSYS GSM is operated as a stand-alone device, i.e. it is not connected via the serial interface.

➢ The INSYS GSM is operated at a device which does not support hardware handshake.

6.2.7 Send and receive SMS

The INSYS GSM can create as well as receive SMS messages via AT commands. The respective commands and parameters are listed in the separate document "AT Command Set For INSYS GSM 4.2" at http://www.insys-tec.de.

▶ **Note**
For activated, automatic SMS processing, the INSYS GSM reads the SMS messages once every minute. After that it edits the SMS messages and deletes them.

Pertinent AT commands	
ATSMSRX**	Automatic SMS reception processing
AT+CMGD	Delete SMS message
AT+CMGF	SMS message format
AT+CMGL	List SMS message
AT+CMGR	Read SMS message

AT+CMGS	Send SMS message
AT+CSCA	Number of the SMS service center
AT^SMGL	List SMS messages (without changing the status)
AT^SMGO	SMS overflow
AT^SMGR	Read SMS message (without changing the state)

6.2.8 SMS Dispatch to fax and e-mail

An SMS can also be sent to a fax device or an e-mail address with support of the GSM provider.

Examples:

1. In order to transmit a message via SMS from the T-D1 network to the fax number 0123/456789 select the following settings:

Meaning:	Parameters:
SMS service center:	**+491710760000**
Phone number:	99**0123456789**
Message: 140 text characters max.	`Message`

2. In order to transmit a message via SMS from the Vodafone network to the e-mail recipient **name@domain.de**, select the following settings:

Meaning:	Parameters:
SMS service center:	**+491710760000**
Phone number:	**3400**
Message: You must enter a space between the e-mail address and the message. The character @ of the e-mail address must be replaced by the character *.	**name*domain.de** message

6.2.9 Example: Free SMS dispatch via AT commands

You can use the INSYS GSM via the serial interface to send free text messages.

The example shows the process - logged in a terminal window.

1. One-time preparation

Meaning:	**AT** command
Logged into the GSM network?	**at+cops?**
Response: Not logged in	*+COPS: 0*
	OK
Entering the PIN 1234	**at+cpin=1234**
	OK
Logged into the GSM network?	**at+cops?**
Response: logged into T-Mobile D	*+COPS: 0,0,"T-Mobile D"*
	OK
Service Center Number?	**at+csca?**
Response:has already been entered	*+CSCA: "+491710760000",145*
	OK
Set SMS text mode	**at+cmgf=1**
	OK

2. Sending the message

Meaning:	**AT** command
Write SMS to 016097332811	**at+cmgs=+4916097332811**
Message text: "test message, 17° Celsius" (Always start the text after the character ">")	**> test message, 17° Celsius.**
Text entry is completed. *(Press the keys [Ctrl] and Z simultaneously)*	**[CTRL+Z]**
Send message to your own number as a test	**+CMGS: 100**
Read SMS	**at+cmgl**
	CMGL: 1,"REC UN-READ","+4916097332811",,"03/11/21,11:42:43+4" *test message, 17 degrees Celsius* *OK*

6.3   Alarm Functionality

The INSYS GSM has two independent digital inputs for alarm detection.

Alarms are triggered by connecting an alarm input to ground. The alarm input is on HIGH potential by a pull-up resistor in open state. During an alarm, the INSYS GSM can send an alarm message or activate the pertinent switch output.

6.3.1 Querying the alarm inputs

You can query the state of the alarm inputs via AT commands, SMS or DTMF.

AT command

Enter the command **AT**IN?** via a terminal program or the HSComm terminal window.

The AT command will send the following response:

OPEN   Not activated, open

CLOSE   Activated, connected to ground

SMS query

The automatic processing of SMS messages must be enabled (see Chapter Automatic SMS processing).

DTMF query

The processing of DTMF tones must be enabled (see Chapter DTMF tone processing).

6.3.2 Alarm types

Each of the two alarm inputs can be configured either as simple alarm input or als pulse input. This results in two different alarm inputs:

➢ Simple alarm

➢ Pulse alarm

The characteristics and configuration of the alarms are described in the following.

Simple alarm

A simple alarm is triggered by changing the alarm input from HIGH to LOW/GND. The alarm is accepted after 0.3 seconds. Even if it is configured as pulse input, a simple alarm is triggered as soon as the input is connected to ground for at least 4 seconds – irrespective of the prior history.

You can assign a message with a message text of max. 140 characters to the single alarm.
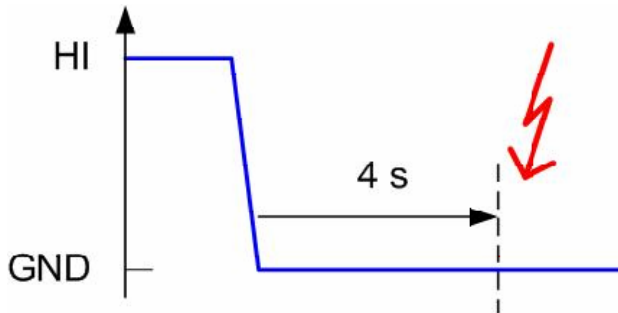
Pulse alarm

Sequences of up to 10 pulses can be detected as different alarms at the pulse input.

Pulses and pauses may last from 0.3 to 2 seconds.
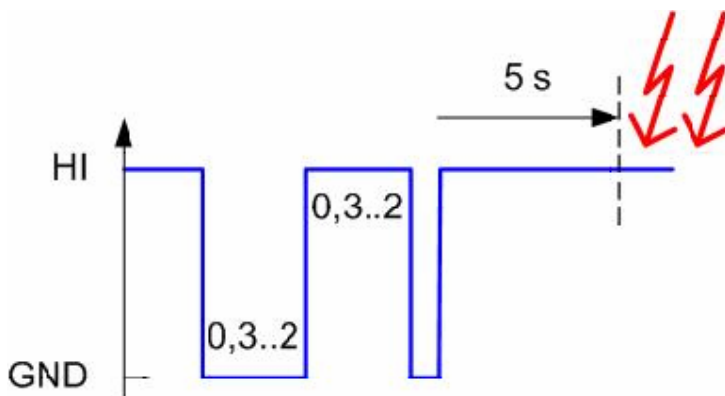
You can assign each pulse alarm a message with the following design:

  ➢ A group message text with max. 140 characters
  ➢ A message text with max. 140 characters

  ▶ **Note**
     A collective message and a message may have only 140 characters altogether.

The pulse input can be used particularly to transmit several alarm states from small PLCs like SIEMENS Logo!™, Crouzet Millenium™, Comat BoxX™ or Moeller Easy™. A demonstration program for creating such pulse sequences with the PLC Siemens Logo! is available on request (send e-mail to insys@insys-tec.de).

6.3.3 Possible reactions to incoming alarms

Depending on the alarm type you can configure the following functions for incoming alarms:

Alarm transmission medium	Simple alarm	Pulse alarm
Establishing a "Long data connection" The data connection will be terminated in the following cases: ➢ The alarm input is no longer active. ➢ Via the idle detection ➢ If the remote terminal hangs up ➢ DTR drop ➢ AT command **+++ATH**	✓	–
Establishing a "Short data connection" The data connection is immediately terminated after the message has been transmitted.	✓	✓
Sending an alarm message as SMS (see Chap. 6.2.6)	✓	✓
Establishing a voice connection The data connection will be terminated in the following cases: ➢ The alarm input is no longer active. ➢ If the remote terminal hangs up	✓	–
Switching the corresponding switch output	✓	✓

▶ **Note**
The INSYS GSM 4.2 compact has no audio interface.

6.3.4 Possible recipients of an alarm message

Depending on the medium, the following terminal devices can be recipients of an alarm message:

Medium	Recipient
Data connection	Analogue modem, ISDN TA or GSM device
Voice connection	Mobile phone or fixed network
SMS	➢ Mobile phone ➢ Fax device (depending on the provider) ➢ E-mail recipient on the internet (depending on the provider) ➢ Fixed network telephone (voice output through network providers)

For fax dispatch, enter the fax prefix of your GSM provider before the actual fax number. (Examples see Chap. 0)

For the e-mail dispatch, send the SMS to the mail gateway of your GSM provider (examples, see Chap. 0). Start the SMS text with the e-mail address of the recipient, followed by a space and the message.

6.3.5 Processing of the alarm messages

Before the INSYS GSM sends an alarm message via SMS or data connection or establishes a voice connection, it will disconnect an existing data connection.

The INSYS GSM ignores incoming commands during the processing of the alarm actions.

If during the alarm processing of one input the other input is activate, the INSYS GSM stores the second alarm state. The INSYS GSM will first complete the processing of the first alarm before processing the second alarm (in chronological order).

If no connection can be established, the INSYS GSM attempts as many dial-ups as configured in the basic settings, in intervals of approximately 60 seconds). (see Chap. 6.1.3)

The LED `Status` is flashing during the alarm processing.

6.3.6 Main recipient and additional recipients

You must assign each alarm message a main recipient.

Each alarm message, which is dispatched by SMS or via "Short data connection", can be sent additionally to 10 further recipients from a pool of 20 numbers.

The alarm messages are all transmitted in the same way (via SMS or "Short data connection") to the main recipient and the additional recipients.

6.3.7 Procedure: Configcure alarms

You can configure the alarms with the configuration software HSComm or directly with AT commands.

▶ **Restrictions for SMS texts**

The internal GSM character set does not match the usual ASCII character set of PCs in all positions.
Therefore, the following restrictions must be observed for SMS texts:

➢ Never use the character 0x00h.

➢ Permitted text characters in SMS messages are only letters (without umlauts), digits, punctuation marks, brackets, underscore, %, & *.

➢ 8-bit characters (e.g. umlauts) and $ @ { } [ ] ^ ° ` ´ are not supported.

➢ In e-mail addresses, the character @ must be replaced by the character * . KPN in the Netherlands requires replacement by the character!

➢ If you do not enter the message text via the entry mask of the HSComm software, you must replace the underscore by the letter 0x11h.

Example: Input of pulse messages:

1. Switch to the tab "Alarm/Switch1" or "Alarm/Switch2".

2. Define the alarm type in the field "Alarm trigger".

   Depending on the alarm type you can only enter one message. For a pulse alarm, you can enter the collective message and 10 individual messages.

3. Define the transport medium in the field "Medium for alarm transport".

4. Enter the message text in the field "Message text". For pulse alarm, also enter the collective message text in the field "Collective message text".

5. Enter the according recipient number in the field "Recipient number".

6. If you need to set the according switch output for the incoming alarm, you need to enable the control box "Alarm at alarm output" in the group "Switch output 1" or "Switch output 2".

7. If you want to enter more alarm recipients, switch to the tab "Additional recipients".

   Here you can enter additional recipients for alarms that are being sent via SMS or "Short data connection".

If you entered several recipients for an alarm, the symbol is displayed next to the according recipient number in the tab "Alarm/Switch 1" or "Alarm/Switch 2"

Example:

Mobile phone number	
+491731223228 +491606749832 +491727895431	The pulse alarm message 2 of the alarm input 1 is sent to the specified numbers as well.
+491731223228	The pulse alarm messages 2, 3, 4, 5, 8 and 9 of the alarm input 1 are sent to this number as well.
+491606749832	The simple alarm message of the alarm input 2 is sent to this number as well.

Pertinent AT commands	
`AT**MSG`	Alarm message text
`AT**DST`	Main target number for alarm messages
`AT**DIAL`	Dial-up attempts for periodic alive or alarm messages
`AT**SCN`	SMS service center number
`AT**COMBINE`	Combination of the alarm text with a target number from the number pool
`AT**POOL`	Phone number pool for alarm messages
`AT**IN`	Querying the Alarm Inputs
`AT**INPUT`	Configuration of the alarm inputs
`AT**SMS`	Manual SMS dispatch of stored alarm messages

6.4   Switch Outputs

The INSYS GSM has two potential-free relay switches (see Chap.2.5.7), which can be switched through a command or the status of the device.

You configure both switch outputs independently from each other.

You have the following options for switching the switch outputs:

➢ AT command

➢ SMS command (see Chap. 6.2.4)

➢ DTMF query (see Chap. 6.1.2)

SMS command

The automatic processing of SMS messages has to be enabled. (see Chap. 6.2.3)

DTMF command

The automatic processing of DTMF tones has to be enabled. (see Chap. 6.1.2)

Additional options

The following additional options are available:

➢ Activate by waiting alarm at relevant alarm input

The INSYS GSM can signal to an external device that the alarm input is busy.

➢ Activate for the duration of an incoming RING signal

An incoming RING signal switches the switch output active. With this, an external signal (lamp, horn) can be switched, for example.

➢ Activate on radio network loss

The INSYS GSM switches the switch output if the GSM radio network fails.

▶   **Note**

The following conditions must be complied with for switching on radio network loss.

➢ `AT**GSMREQ=1`

➢ The serial interface is inactive.

The failure may last up to 60 seconds until the INSYS GSM switches the switch output.

Procedure: Configure the switch outputs with HSComm

1.   Switch to the tab "Alarm/Switch1" or "Alarm/Switch2".

2.   Activate the requested activation type for the switch output in the group "Switch output1" or "Switch output2".

Examples:

Procedure: Switch outputs with AT commands

Pertinent AT commands	
`AT**OUTPUT`	Configuration of the switch outputs
`AT**OUT`	Manual switching of the outputs

Example: Configure the switch output 1 to the pertinent alarm input

Enter the command `AT**OUTPUT1=0,0,0,1`.

`AT**OUTPUT[<output>]=<man>[,<ri>[<net>[<alarm>]]]`

Meaning	Parameters	Possible values	Meaning	Default:
Switch output, for which the setting shall be valid.	`<output>`	1	Switch output 1	1
		2	Switch output 2	
Manual switching with command `AT**OUT`, via SMS or DTMF	`<man>`	0	Not released	0
		1	Released, The settings`<ri>`, `<net>` and `<alarm>` are deactivated (no entry required).	
Switching for incoming connection request (RING signal of the GSM engine)	`<ri>`	0	Not activated	0
		1	Activated	
Switching for GSM network failure	`<net>`	0	Not activated	0
		1	Activated	
Switching for alarm at the relevant alarm (Input 1 → OUT1, Input 2 → OUT2)	`<alarm>`	0	Not activated	0
		1	Activated	

▶ **Note**
By default, the switch outputs are set to switching via the command `AT**OUT`.

Example for switching the switch output 2 with the AT command `AT**OUT`
Enter the command `AT**OUT2=1`.

`AT**OUT[<output>]=<status>`

Meaning	Parameters	Possible values	Meaning	Default:
Switch output, for which the setting shall be valid.	`<output>`	1	Switch output 1	1
		2	Switch output 2	
Requested status of the switch output	`<status>`	0	Switch output on normally open	0
		1	Switch output on normally open	
		`PULSE<xx>`	Switch output is pulsed <xx> times. The switching process takes place in intervals of seconds. <xx> = Number of pulses (two-digit)! <xx> has a range of values from 0 to 10.	

6.5 Access Control

You can protect the INSYS GSM from unauthorized access. The following options are available:

- ➢ Selective Call Answer
- ➢ Passwords and DTMF PIN
- ➢ Security callback

You can configure the access protection in the HSComm in the tab "Access control".

6.5.1 Selective call answer

When this option is activated, the INSYS GSM will only accept connections from the specified phone numbers. You have the option to allow entire number blocks; the wild card character * replaces exactly any one digit. The selective call acceptance is also valid for data and voice connections as well as incoming SMS commands.

> ► **Note**
> To use this function, the caller may not deactivate the calling line identification presentation (CLIP).

> ► **Note**
> The selective call acceptance is only active after a device reset.

Number Format

The allowed number has to be entered in exactly the same format as it is output for a call with "+CLIP: ...." (without ""). The transmitted format of the number may depend on the provider – e.g. the leading "+49" may be replaced by "0049".

> ► **Note**
> We urgently recommend verifying the number by placing a test call.

Procedure: Configure selective call acceptance

1. In the tab "Access control" in the group "Selective call acceptance", activate the control box "Only accept calls from these numbers".
2. Enter the requested numbers in the entry fields.
3. Perform a reset. (see Chap. 2.8.2)

Pertinent AT commands	
ATCLIP**	Selective Call Answer
ATRESET**	Device reset

Non-authorized numbers

The INSYS GSM will reject calls from non-authorized numbers immediately to keep the line free. These calls can also not be accepted manually (**ATA**). The caller receives the signal *BUSY*.

The GMS engine will then work with the setting **AT+CLIP=1**. For each incoming call, the following phone number is displayed as well:

Ring

+CLIP: „+49941560061",145,,,,0

6.5.2 Passwords and DTMF PIN

Besides the PIN for the SIM card (see Chap. 6.1.1), which controls the access to the GSM network, the INSYS GSM manages three other passwords/PINs to control the access to the following:

➢ Data connection, security callback
➢ Remote configuration, control by SMS
➢ Switching via DTMF

The password consists of a maximum of 16 characters.

Data connection, security callback

This password controls

➢ Incoming data connections
➢ Triggering the security callback (see Chap. 6.5.3)

When an incoming connection is accepted and established, the caller is asked to enter the password after 2 seconds:

If no valid password is entered within 60 seconds, the INSYS GSM will terminate the connection. A valid password is acknowledged with *OK*.

If no security callback number is entered (see Chap. 6.5.3), the connection is free for data transmission after 2 seconds.

Remote configuration, switching via SMS

This password controls

➢ Switching to remote configuration via data connection
➢ Accepting SMS messages to switch and query the inputs/outputs (see Chap. 6.2.2)
➢ Accepting SMS messages with extended `AT**` commands (see Chap. 6.2.4)

During a data connection, you can switch to remote configuration mode by entering the escape sequence (default setting `***`). (see Chap. 4.1)

Switching via DTMF

The DTMF PIN controls the access to switch and query the inputs/outputs via DTMF tones during a voice connection. The DTMF PIN consists of 4 digits.

Procedure: Configure the passwords and the DTMF PIN

1. Start the HSComm and switch to the tab "Access control".

2. To configure a password, click on the button "Set password" in the group "Password for" at the desired password.

   A dialog box to enter the password is opened.

3. Enter the password.

   The password is sent to the INSYS GSM.

4. Activate the control box "Password active" next to the requested password.

Pertinent AT commands	
ATPASS**	Password

6.5.3 Security callback

The security callback process:

1. If a security callback number was entered, the INSYS GSM will query the password for all connections and terminate the connection.

2. If the password was correct, the INSYS GSM will establish a new connection to the security callback number after 30 seconds.

3. When this connection is established, the message CALLBACK IN PROGRESS is sent after 2 seconds. After further 2 seconds the interface is free for data transmission.

4. If the remote terminal is busy, the INSYS GSM will redial according to the setting "Dialing attempts". (see Chap. 4.1)

The LED **Status** is flashing during the security callback process.

The security callback number is independent from the caller number, which triggers the security callback.

Outgoing calls from the INSYS GSM are not affected.

Procedure: Activate security callback

1.   Start the HSComm and switch to the tab "Access control".
2.   Enter the requested number in the group "Callback number"

Pertinent AT commands	
AT**PASS	Password
AT**DIAL	Connection attempts
AT**CALLBACK	Target number security callback

6.6 History

The current values from the internal history list are read out and displayed. The INSYS GSM records the following events continuously in a ring buffer.

The ring buffer always contains the last 200 entries. The buffer will be deleted when resetting to factory settings. The entries will be displayed in chronological order on max. 4 pages.

Export as text

The displayed data can be stored as text file. Have this data ready for technical support.
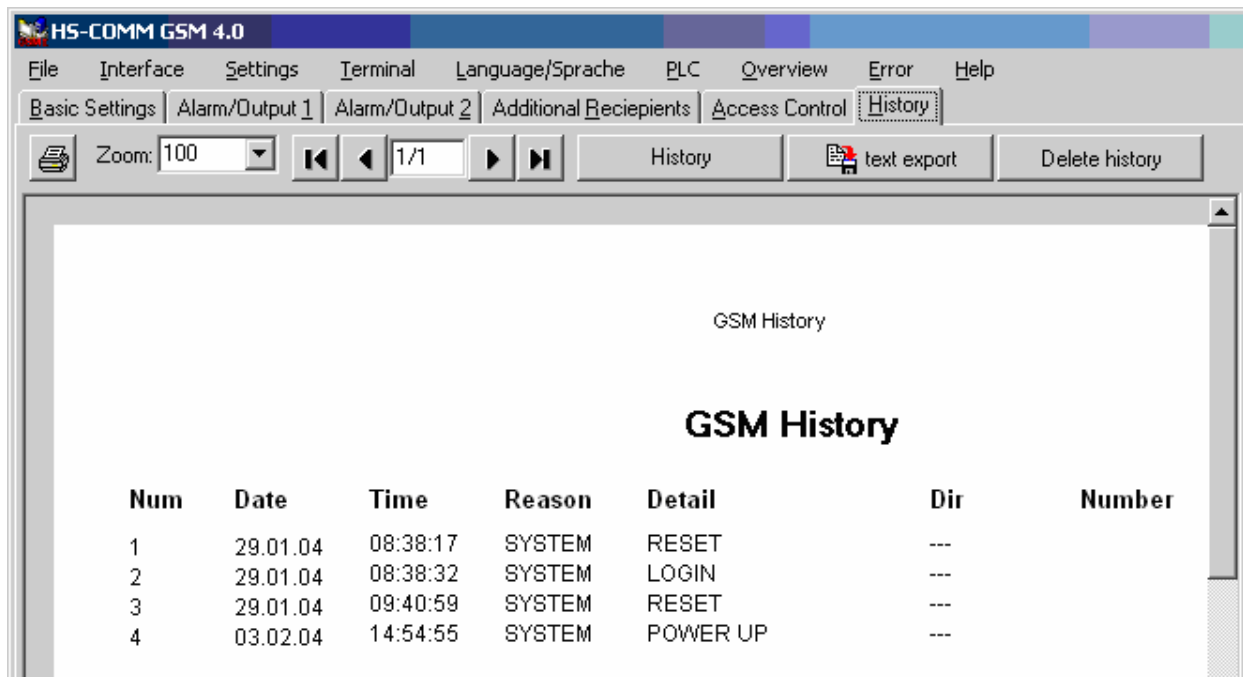
Meaning of the entries:

Reason	Detail	Meaning
SYSTEM	RTC ERROR	Internal real time clock is faulty (time stamp empty)
	RTC RESET	The internal real time clock has been reset as the gold cap was discharged (power reserve used up). Time stamp: 00:00:00 01.01.03
	GSM ERROR	Instruction from controller to GSM engine could not be processed correctly (e.g. AT command, dial-up, SMS dispatch...)
	SIGNAL ERROR	Field strength not ascertainable (**AT**SIGNAL?**: 99)
	LOGOUT	GSM engine logged out (update interval like STATUS LED)
	LOGIN	GSM engine logged in (update interval like STATUS LED)
	REMOTE PARAM	Remote configuration started (*** detected)
	ALIVE	Alive SMS process starts
	RESET	Software/hardware reset
	POWER UP	Power up; upon return of voltage
SECURITY	DPW ERROR	Wrong data password or timeout expired

	PPW ERROR	Wrong configuration password or timeout expired
	TPW ERROR	Wrong entry of DTMF PIN or timeout expired
	CLIP ERROR	Call with invalid phone number (selective call acceptance)
	SECURITY CALLBACK	Security callback process starts
ALARM	Start	Alarm at alarm input
	End	Alarm at alarm input processed
	Quitt	Acknowledging an alarm message
VOICE	Start	Outgoing voice connections Incoming voice connections for activated DTMF processing Number for outgoing calls Number for incoming calls for activated selective call acceptance
	End	Voice connection terminated
DATA	Start	Data connection outgoing or incoming; Incoming number only for activated selected call acceptance
	End	Data connection terminated
SMS	Power up	Power up SMS was sent
	PARAM	SMS for configuration has been received*
	QUITT	SMS with the text QUITT has been received*
	QUITT	SMS for acknowledging an configuration SMS has been sent*
DTMF	PARAM	DTMF command has been detected

*) automatic SMS processing must be activated.

The following columns of the history list are displayed in addition:

Dir

Direction of the logged events:

IN   Incoming calls and SMS messages

OUT   Outgoing calls and SMS messages

Number

The involved phone numbers, alarm inputs and number of pulses are recorded when applicable.

Date/Time

Time stamp of the internal clock

Pertinent AT commands	
ATHISTORY**	Read out history list

6.7   Audio Interface and Voice Connections

The INSYS GSM 4.2 has a standard RJ45 phone plug at the front to connect a phone handset of reference type Handset Siemens Gigaset (see Chap. 2.5.5).

▶   **Note**
The INSYS GSM 4.2 compact has no audio interface.

The connection is set up and closed either by **AT** commands in the terminal program or by an accordingly configured alarm input ("Medium for alarm transport: Voice" see Chap. 6.3.3).

Pertinent AT commands	
ATD<nr>;	Set-up voice connection
ATH	Terminate connection
ATA	Accept call

6.8   Flash update

You can update the INSYS GSM firmware locally or via a data connection. The firmware is available as ***.MHX** file from the technical support department.

Call technical support at:

➢ E-mail: insys@insys-tec.de

➢ 0941/560061

Local flash update

1.   Set the baud rate of the terminal to 19200 bps, as the responses are operated using this baud rate. (see Chap. 5.3.1)

2.   Hardware handshake must definitely be activated.

Remote flash update

1.   Set the baud rate of the INSYS GSM to 19200 bps to prevent a crash of the flash update.

2.   Hardware handshake must definitely be activated on the

➢   terminal side

➢   remote terminal modem

3.   At the terminal program that initiates the flash process, set a line delay of at least 100 ms (carriage return character TX=CR).

The duration of the remote flash is approx. 5 minutes.

Procedure: Perform flash update:

Entry in terminal	`AT**FLASH`
The flash update process starts if the **ESC** character key is pressed within 60 seconds. This prompt also appears for every restart (with a timeout of 2 seconds).	*Start Update with Esc, Reset with @*
Prompt for sending Send the firmware as ***.MHX** file.	*Expecting download with 8N1*

Required settings of the terminal program:

Log: ASCII
Data format: 8N1
Handshake: Hardware

The INSYS GSM will perform a complete reset after the flash update is finished.

If necessary, the INSYS GSM will load the default factory settings. The SIM card PIN will remain unchanged.

Pertinent AT commands	
AT**FLASH	Firmware update of the controller

6.9 Operation with PLCs

Generally, the INSYS GSM will be connected to a PLC or a PC with a pertinent application via the serial interface and will provide the data connection for it via GSM to the remote device.

Depending on which PLC you are connecting, you must initialize the INSYS GSM or the modem accordingly.
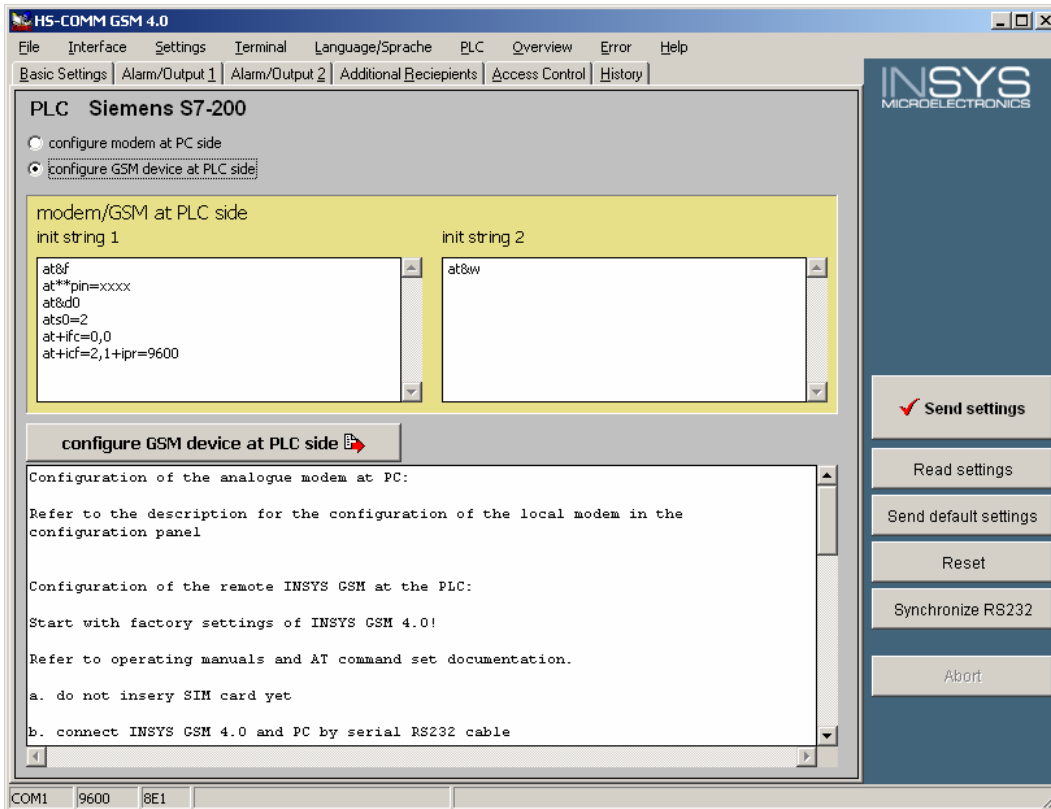
For setting the PLC data, two modem settings are available:

  ➢ Configure PC modem

   When you activate the entry "Configure PC modem", the modem will be configured at the PC (e.g. at the control center) for the according PLC.

  ➢ Configure the GSM device at the PLC

   When you activate the entry "Configure GSM device at PLC" , the modem will be configured directly at the PLC.

The INSYS GSM has been tested for the most common PLC systems on the market. The documentation regarding the required settings for the according PLC is available from INSYS MICROELECTRONICS (mailto: insys@insys-tec.de).

Currently, documentations for the following PLC systems are available:

- ➢ Bosch SPS CL400
- ➢ Mitsubishi MELSEC FX 2N / 232BD
- ➢ OMRON SPS C200HX – CPU44
- ➢ PILZ SPS PSS3056
- ➢ Schiele SPS S400
- ➢ Siemens S7/200
- ➢ Systron S200, S250 and S400

▶ **Note**

You can adjust the default settings for the initialization and communication strings. Changes will not be saved.

Procedure: Initialize

1. Start the software HSComm.
2. Open the menu "SPS".
3. Select between the option buttons "Configure PC modem" and "Configure the GSM device at the PLC"
4. Click the menu entry "PLC".

    A list of preconfigured PLCs is displayed.
5. If available, select the requested PLC.
6. Enter the required initialization string, if necessary.
7. Send the settings using the buttons "Configure GSM device at the PLC" or "Configure PC modem".

7 AT Command Sets

You can configure and control the INSYS GSM with two AT command sets:

➢ Standard AT commands

The standard AT commands control the GSM engine to establish data connections using the GSM network.

➢ Extended INSYS AT** commands

The extended INSYS AT** commands control the extensions implemented by IN-SYS for the digital inputs and outputs, alarm functions, security functions and timer-controlled functions.

The following options are available to enter the standard commands:

➢ Locally via the serial interface in offline command mode (see Chap. 4.2)

➢ Locally via the serial interface in online command mode (see Chap. 0)

The following options are available to enter the extended INSYS AT** commands:

➢ Locally via the serial interface in offline command mode (see Chap. 4.2)

➢ Locally via the serial interface in online command mode (see Chap. 0)

➢ Remote in command mode - remote configuration (see Chap. 4.2.3)

➢ Via SMS (see Chapters 0 and 6.2.4)

In most cases, it is possible to enter the command as SMS. The configuration via SMS is restricted to commands with responses of up to 140 characters.

The most important standard AT commands and all extended AT commands are listed in the document "AT Command Set for INSYS GSM 4.2", which is available from IN-SYS MICROELECTRONICS (e-mail to insys@insys-tec.de) and at the website http://www.insys-tec.de . The complete command reference for the standard AT commands is also available on request.

Regarding the time sequence of the interface commands, please apply the modem guideline V.25 ter.

The AT standard is a line-oriented command language. The input is not context-sensitive. All commands are completed using the carriage return character which is set with the registry ATS3 (Default = <CR> = 0x0Dh).

> ▶ **Note**
>
> Lining up several commands per input line is not possible for the extended INSYS AT** commands. Further commands can be sent only after the processing of the previous command is completed, i.e. the response has been output.

For lining up standard AT commands, please refer to the detailed command set of the GSM engine.

The IT commands implemented in INSYS GSM 2.x are replaced by the extended INSYS AT** commands with the Format `AT**name`. Switching to configuration mode is no longer required. Chap. 7.2 shows a comparison between IT commands and INSYS AT** commands.

7.1 Short Description INSYS AT Commands

Command	Short description	Configuration		
		Local	Remote	SMS
AT**ALIVE	Periodic alive SMS	X	X	S
AT**BAUD	Baud rate of the serial interface	X	X	X
AT**CALLBACK	Target number security callback	X	X	X
AT**CLIP	Selective Call Answer	X	X	S
AT**COMBINE	Combination of the alarm text with a target number from the number pool (**AT**POOL**)	X	X	S
AT**DATE	Date	X	X	X
AT**DAY	Weekday	X	X	X
AT**DEFAULT	Factory settings of the INSYS AT** commands	X	X	X
AT**DIAL	Dial-up attempts for periodic alive or alarm messages	X	X	X
AT**DST	Main target number for alarm messages	X	X	S
AT**DTC	Idle connection control (Data Transmit Controller)	X	X	X
AT**DTMF	Enable DTMF processing	X	X	X
AT**ESC	Escape character for remote command mode	X	X	X
AT**EXIT	Exiting the remote command mode		X	
AT**FLASH	Firmware update of the controller	X	X	
AT**FORMAT	Data format of the serial interface	X	X	X
AT**GSMREQ	Periodical query of the field strength and the login state in the GSM network	X	X	X
AT**HISTORY	History function (event memory)	X	X	S
AT**IN	Querying the Alarm Inputs	X	X	X
AT**INPUT	Configuration of the alarm inputs	X	X	X
AT**LOGOUT	Timer-controlled logout/re-login or device reset respectively	X	X	X
AT**MSG	Alarm message texts	X	X	S
AT**OUT	Set/reset the switch outputs	X	X	X
AT**OUTPUT	Configuration of the switch outputs	X	X	X
AT**PASS	Password Protection	X	X	X

`AT**PIN`	SIM card PIN	X	X	X
`AT**POOL`	Phone number pool for alarm messages	X	X	S
`AT**POWER`	Dispatch of SMS during power up	X	X	X
`AT**PROFILE`	Query of the settings of the INSYS AT** commands	X	X	
`AT**PROVIDER`	Manual GSM provider selection	X	X	X
`AT**RESET`	Device reset	X	X	X
`AT**SCN`	SMS service center number	X	X	X
`AT**SIGNAL`	GSM signal field strength	X	X	X
`AT**SMS`	Manual SMS dispatch of the stored alarm messages	X		X
`AT**SMSRX`	Automatic SMS reception processing	X	X	X
`AT**SMSBUF`	Specification of existing SMS storage locations on the SIM card	X	X	X
`AT**TIME`	Time	X	X	X
`AT**VERSION`	Query of the software version	X	X	X

X = completely implemented   S = only setting implemented

7.2   Comparison IT Commands / INSYS AT** Commands

The IT commands implemented in INSYS GSM 2.x are replaced by the extended INSYS AT** commands with the Format `AT**name` . Switching to configuration mode is no longer required.

IT command	INSYS AT** command	New
`ITA`	`AT**OUTPUT` `AT**INPUT`	Configuration outputs Configuration inputs
`ITA*`	`AT**OUT`	Switching also possible locally via command
`ITAS`	`AT**OUTPUT` `AT**SMSRX`	Automatic SMS reception processing has to be enabled with `AT**SMSRX`
`ITB`	`AT**BAUD`	Common baud rate for controller and GSM engine
`ITD`	`AT**DST`	
`ITDC`	`AT**CALLBACK`	
`ITE`	*Not applicable*	Standard AT command `ATE`
`ITF`	`AT**FORMAT`	Common data format for controller and GSM engine
`ITI`	`AT**IN`	Query also locally
`ITM`	`AT**DATE` `AT**DAY`	New: Weekday with `AT**DAY`
`ITN`	`AT**MSG`	
`ITO`	`AT**LOGOUT`	Additional device reset possible
`ITP`	`AT**PIN`	4 to 8 digit PIN possible
`ITR`	`AT**PROFILE`	
`ITS`	`AT**SCN`	
`ITT`	`AT**TIME`	Extended (with seconds)
`ITU`	`AT**PROVIDER`	
`ITV`	`AT**DIAL`	
`ITW`	`AT**PASS`	
`ITX`	`AT**EXIT`	
`ITY`	`AT**SMS`	
`ITZ`	`AT**RESET`	

8 Table: GSM - Service Center Numbers

In the following, you will find an overview of the most important mobile providers in Germany, Austria, and Switzerland (2002). No responsibility is assumed for the correctness and completeness of this information. The given numbers may only be valid for particular contracts with the network provider.

Please find the current data for your SIM card in your contract documents.

Coun-try	Provider	Network	SMS Service Center Number (SCN)	Fax Prefix	Number of the E-mail gateway
D	T-Mobile	T-D1	+49 171 076 0000 +49 171 209 2522	99 (German) 98 (English)	8000
D	Vodafone D2	D2 Vodafone	+49 172 227 0000 +49 172 227 0042 +49 172 227 0111 +49 172 227 0010 +49 172 227 0222 +49 172 227 0333	99	3400
D	E-Plus	E-Plus	+49 177 061 0000 +49 177 060 0000 +49 177 062 0000	1551	767 62 45
D	O2	O2	+49 176 0000 443 +49 176 0000 433	329	6245
D	Mobilcom	D1	+49 171 076 0315	1091	1090
D	Mobilcom	D2	+49 172 0227 0880	1091	
D	Mobilcom	E-Plus	+49 177 061 0000	1551	
A	Mobilkom	A1	+43 334 0501 +43 664 0501	-	-
A	max.mobil		+43 676 021	6762	6761
A	One (Connect)		+43 699 000 1999	-	-
CH	Orange	Orange	+41 78 777 7070		
CH	Swisscom	Swiss GSM	+41 79 499 900 0 +41 79 499 812 3		
CH	TDC	Sunrise	+41 76 598 0000		